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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/676,866	09/29/2000	Ron Maurer	1000735-1	3319

22879 7590 03/25/2009

HEWLETT PACKARD COMPANY
P O BOX 272400, 3404 E. HARMONY ROAD
INTELLECTUAL PROPERTY ADMINISTRATION
FORT COLLINS, CO 80527-2400

EXAMINER	
SHERALI, ISHRAT I	

ART UNIT	PAPER NUMBER
2624	

NOTIFICATION DATE	DELIVERY MODE
03/25/2009	ELECTRONIC

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JERRY.SHORMA@HP.COM
mkraft@hp.com
ipa.mail@hp.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RON MAURER

Appeal 2008-5642
Application 09/676,866
Technology Center 2600

Decided[1]: March 23, 2009

Before KENNETH W. HAIRSTON, JOHN A. JEFFERY, and BRADLEY W. BAUMEISTER, *Administrative Patent Judges*.

BAUMEISTER, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF CASE

Appellant appeals under 35 U.S.C. § 134 (2002) from the Examiner's rejection of claims 1, 2, 16, 17, and 29.[2] Claims 3-15, 18, 20-28, 30-34, and

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

36-48[3] have been indicated as containing allowable subject matter. We have jurisdiction under 35 U.S.C. § 6(b) (2002). We affirm.

A. Appellant's invention

Appellant's invention relates to a method of reducing chromatic bleeding artifacts in a digital image. The method comprises reducing chrominance values of at least some pixels in the digital image. The chrominance value of a pixel is reduced by an amount that is scaled according to the chromatic dynamic range of the pixel's local neighborhood. (Br. 2).

B. The claims

Independent claims 1 is representative.[4] It reads as follows:

> 1. A method of reducing chromatic bleeding artifacts in a digital image, the method comprising reducing chrominance values of at least some pixels in the digital image, the chrominance value of a pixel reduced by an amount that is scaled according to its chromatic dynamic range.

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[2] The Examiner has withdrawn the rejections of claims 14, 28, 34, 36 and 45 (Ans. 2). The Examiner first states in the Status of Claims section of the Examiner's Answer that claim 29 contains allowable subject matter (Ans. 2). However, the Examiner also states that claim 29 is rejected as anticipated by Harrington (Ans. 3, 7, 10). We interpret the Examiner's statement regarding claim 29's allowable subject matter to be a clerical error. We will treat claim 29 as rejected.

[3] The Examiner's Answer fails to confirm the status of claims 46-48. We interpret this omission to be a clerical error intending to state that claims 46-48 contain allowable subject matter.

[4] Appellant argues claims 1, 2, 16, 17, and 29 together as a group. *See* Br. 5-7. Accordingly, we select independent claim 1 as representative.

C. The references and rejections

The Examiner relies on the following prior art references to show unpatentability:

Harrington	US 6,031,581	Feb. 29, 2000 (filed June 26, 1997)

1. Claims 1, 2, 16, 17, and 29 stand rejected under 35 U.S.C. § 102(e) as anticipated by Harrington.

Rather than repeat the arguments of the Appellant or the Examiner, we refer to the Brief and the Answer for their respective details.[5] In this decision, we have considered only those arguments actually made by Appellant. Arguments which Appellant could have made but did not make in the Brief have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

ISSUE

The Examiner asserts that Harrington, which is also directed to a system of reducing chromatic bleeding artifacts in a digital image, anticipates claims 1, 2, 16, 17, and 29 (Ans. 3-12).

Appellant does not dispute that Harrington's revised chrominance value may be reduced relative to the initial chrominance value (FF 1). Appellant also does not dispute that the revised chrominance value is

[5] We refer to (1) the Appeal Brief filed Jan. 25, 2007 and (2) the Examiner's Answer mailed Aug. 7, 2007 throughout this opinion.

achieved through a scaling operation (FF 2). Appellant only argues that "Harrington does not teach or suggest reducing the chrominance value of a pixel by an amount that is *scaled according to its chromatic dynamic range*" (Br. 5; emphasis in original).

The issue before us, then, is whether Appellant has shown that the Examiner erred in finding that Harrington teaches reducing the chrominance value of a pixel by an amount that is scaled according to the chromatic dynamic range of the pixel's local neighborhood.

FINDINGS OF FACT

The record supports the following Findings of Fact (FF) by a preponderance of the evidence:

1. Appellant does not dispute that Harrington's revised chrominance value may be reduced relative to the initial chrominance value (Br. 5).
2. Appellant does not dispute that the revised chrominance value is achieved through a scaling operation (Br. 5-6).
3. The 3x3 square-shaped local neighborhood of nine pixels depicted in figures 3a-3d of the Specification is only an example of neighborhood sizes. The Specification expressly states that the neighborhood is not limited to any particular size or number (Spec., 7:9-13).
4. Nothing in the Specification precludes the "local neighborhood" from reading on two pixels: the pixel of interest itself and a second pixel that is horizontally or vertically adjacent.
5. The chromatic dynamic range (D) for a pixel of interest *may be* computed as the maximum chroma value of the local neighborhood (C_M)

minus the minimum chroma value of the local neighborhood (C_m) (i.e., $D = C_M - C_m$) (Spec., 4, ll. 27-30; emphasis added).

6. Each pixel's chroma value (C) *may be* computed from chrominance values (C_b and C_r) in various manners, such as $C = (C_b^2 + C_r^2)^{½}$ or $C \approx |C_b| + |C_r|$ (Spec., 4, ll. 22-27; emphasis added).

7. Harrington discloses a system for removing color bleed from an image signal source so that a digital image can be favorably printed (Harrington, col. 1, ll. 5-9).

8. To achieve an improved digital image, Harrington substitutes a revised chrominance value for the initial chrominance signal for each pixel in the image by use of a chrominance revising algorithm (Harrington, col. 2, ll. 34-40).

9. For a pixel of interest, Harrington's chrominance revising algorithm measures the chrominance, c(i,j); the total chrominance, c(i,j) + e(i,j), (where e(i,j) is the chrominance error from previous pixel outputs); and the differences between the pixel's total chrominance and the chrominances of the horizontally and vertically adjacent pixels: $d_{ch}(i,j)$[6] = c(i,j) + e(i,j) - (c(i-1,j)); $d_{cv}(i,j)$ = c(i,j) + e(i,j) - (c(i,j+1)) (Harrington, col. 4, ll. 26-37).

10. Harrington's chrominance revising algorithm also measures the pixel's luminance, y(i,j), and various luminance-based properties (Harrington, col. 3, l. 61-col. 4, l. 57).

[6] It is reasonably clear from the context of their usage that the terms, "$d_{cv}(i,j)$" and "$d_{ch}(i,j)$," were inadvertently juxtaposed in the two equations.

11. Harrington's chrominance revising algorithm calculates a revised chrominance output value, $c_o(i,j)$, as a function of the various chrominance and luminance parameters (Harrington, col. 4, ll. 57-61).

12. Harrington's revised chrominance value, $c_o(i,j)$, may be subsequently limited to be within the minimum and maximum values of a local neighborhood to achieve a final revised chrominance value, $c_z(i,j)$ (Harrington, col. 5, ll. 15-26).

13. The error in Harrington's algorithm made by substituting the final revised chrominance value for the initial chrominance signal c(i,j) may then be distributed to neighboring pixels by an error diffusing algorithm (Harrington, col. 5, ll. 31-55).

14. Appellant's Specification states,

> [a] new chroma value (C') for a pixel of interest may be computed as $C' = C - f(Y,D) \times (C-C_o)$, where C is the original chroma value for the pixel, D is the chromatic dynamic range, C_o is a chromatic modulus having a value between zero and the minimum chroma of the local neighborhood for the pixel, and $f(Y,D)$ is a parametric expression that determines the amount of relative chroma reduction.

(Spec. 5, ¶ 2).

15. In the parametric expression, $f(Y,D)$, "Y" is the pixel's luminance (Spec., 3, ¶ 2), and "D" is the chromatic dynamic range of the neighborhood (Spec. 4, ¶ 5).

PRINCIPLES OF LAW

1. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior

art reference." *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

2. Appellant has the burden on appeal to the Board to demonstrate error in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006).

ANALYSIS

"Before considering the rejections…, we must first [determine the scope of the] claims…." *In re Geerdes*, 491 F.2d 1260, 1262 (CCPA 1974). Accordingly, we first determine the meaning and scope of the claim terms, "local neighborhood" and "chromatic dynamic range."

Regarding the term, "local neighborhood," the Specification provides examples of a 3x3 square-shaped local neighborhood of nine pixels (e.g., figs. 3a-3d). But the Specification also expressly states that the neighborhood is not limited to any particular size or number (FF 3). Nothing in the Specification precludes the "local neighborhood" from reading on two pixels: the pixel of interest itself and a second pixel that is horizontally or vertically adjacent (FF 4).

The chromatic dynamic range (D) for a pixel of interest *may be* computed as the maximum chroma value of the local neighborhood (C_M) minus the minimum chroma value of the local neighborhood (C_m) (i.e., $D = C_M - C_m$) (FF 5). Each pixel's chroma value (C), in turn, *may be* computed from chrominance values (C_b and C_r) in various manners, such as $C = (C_b^2 + C_r^2)^{½}$ or $C \approx |C_b| + |C_r|$ (FF 6). Restated, the chromatic dynamic range is a value derived from—or a function of—local neighborhood chrominance

values. However, the chromatic dynamic range is not necessarily related to the local neighborhood chrominance values by any specific equation. Any equation that incorporates the local neighborhood chrominance values, such as the difference between maximum and minimum neighborhood values, may be used to obtain the chromatic dynamic range. As such, a pixel's chromatic dynamic range may at least be any number that is derived from the difference between chrominance or chroma value of the pixel of interest itself and the chrominance or chroma value of an adjacent pixel.

Harrington discloses a system for removing color bleed from an image signal source so that a digital image can be favorably printed (FF 7). To achieve this improved digital image, the chrominance signal for each pixel in the image is substituted with a revised chrominance value by use of a chrominance revising algorithm (FF 8). Following is a summary of Harrington's chrominance revising algorithm.

For a pixel of interest, the algorithm measures the chrominance, c(i,j); the total chrominance, c(i,j) + e(i,j), (where e(i,j) is the chrominance error from previous pixel outputs); and the differences between the pixel's total chrominance and the chrominances of the horizontally and vertically adjacent pixels: $d_{ch}(i,j) = c(i,j) + e(i,j) - (c(i-1,j))$; $d_{cv}(i,j) = c(i,j) + e(i,j) - (c(i,j+1))$ (FF 9). The algorithm also measures the pixel's luminance, y(i,j), and various luminance-based properties (FF 10). The algorithm then calculates a revised chrominance output value, $c_o(i,j)$, as a function of these various parameters (FF 11). The revised chrominance value, $c_o(i,j)$, may be subsequently limited to be within the minimum and maximum values of a local neighborhood to achieve a final revised chrominance value, $c_z(i,j)$ (FF

12). The error made by substituting the final revised chrominance value for the initial chrominance signal c(i,j) may then be distributed to neighboring pixels by an error diffusing algorithm (FF 13).

Turning to the arguments, Appellant first asserts Harrington scales the pixels' chrominance value based upon luminance values, but not chrominance values (Br. 5). This argument is not persuasive. Harrington's revised chrominance output value, $c_o(i,j)$, is a function of various parameters—expressly including the horizontal and vertical chrominance differences, $d_{ch}(i,j)$ and $d_{cv}(i,j)$ (FF 9-11). The horizontal chrominance difference is a function of the pixel's chrominance minus the horizontally neighboring pixel's chrominance: $d_{ch}(i,j) = f(c(i,j) - c(i-1,j))$. These two pixels, (i,j) and (i-j), may be interpreted as constituting the pixels of a local neighborhood consisting of two pixels.[7] As such, one of the pixels has the maximum local neighborhood chrominance and the other has the minimum local neighborhood chrominance. Accordingly, the value, $d_{ch}(i,j)$, may be interpreted as constituting the "chromatic dynamic range." The same may be said for the vertical change, $d_{cv}(i,j)$. Under either interpretation, Harrington's revised chrominance output value, $c_o(i,j)$, is therefore a chrominance value that has been scaled according to the local neighborhood's chromatic dynamic range.

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[7] It is immaterial to this analysis that Harrington also discusses "local neighborhoods" in the context of the subsequent chrominance limiting step, or that those local neighborhoods may have different dimensions than the two-pixel neighborhood. The claims do not preclude the chrominance revising method from employing multiple "local neighborhoods" of potentially differing sizes.

We agree with Appellant that Harrington also scales the chrominance according to luminance values (Br. 5). However, this fact does not preclude Harrington from anticipating the claims. The claims do not state that the chrominance scaling is performed according to *only* the chromatic dynamic range. Rather, the claims more broadly read on any chrominance scaling algorithm where the chrominance scaling is according to *at least* the chromatic dynamic range. During examination of a patent application, pending claims are given their broadest reasonable construction consistent with the specification. *In re Prater*, 415 F.2d 1393, 1404-05 (CCPA 1969); *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004).

In fact, Appellant's Specification indicates that the broader interpretation is what Appellant actually intended. Appellant's Specification states,

> [a] new chroma value (C') for a pixel of interest may be computed as $C' = C - f(Y,D) \times (C-C_o)$, where C is the original chroma value for the pixel, D is the chromatic dynamic range, C_o is a chromatic modulus having a value between zero and the minimum chroma of the local neighborhood for the pixel, and $f(Y,D)$ is a parametric expression that determines the amount of relative chroma reduction.

(FF 14).

In the parametric expression, $f(Y,D)$, "Y" is the pixel's luminance, and "D" is the chromatic dynamic range of the neighborhood (FF 15). Restated, Appellant expressly discloses that the claimed scaling reduction is based upon luminance as well as the chromatic dynamic range.

We also agree with Appellant that Harrington's subsequently performed, chrominance limiting operation is not a scaling operation (Br. 5-6). "Scaling" involves changing all inputs by some equal proportion. The

limiting operation involves clipping large chrominance values and increasing small chrominance values to be within a predetermined minimum-maximum range, regardless of how far outside the range a value would have otherwise fallen. No scaling or proportional change is involved. However, the fact that Harrington follows the scaling algorithm by a limiting process does not change our decision.

Claim 1 states that the method *comprises* reducing chrominance values by an amount that is scaled. "'Comprising' is a term of art used in claim language which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the claim." *Genentech, Inc. v. Chiron Corp.,* 112 F.3d 495, 501 (Fed. Cir. 1997). As such claim 1 reads on a method that first employs a chrominance scaling process and then further employs a chrominance clipping process.

CONCLUSION OF LAW

Appellant has not shown that the Examiner erred in finding that the cited prior art teaches reducing the chrominance value of a pixel by an amount that is scaled according to the chromatic dynamic range of the pixel's local neighborhood. Accordingly, Appellant has not shown that the Examiner erred in rejecting claims 1, 2, 16, 17, and 29 under § 102.

DECISION

We sustain the Examiner's rejections with respect to all pending claims on appeal. Therefore, the Examiner's rejection of claims 1, 2, 16, 17, and 29 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

gvw

HEWLETT PACKARD COMPANY
P. O. BOX 272400
3404 E HARMONY ROAD
INTELLECTUAL PROPERTY ADMINISTRATION
FORT COLLINS CO 80527-2400